WORLD TELECOMMUNICATION STANDARDIZATION ASSEMBLY

ITU WTSA-20
GENEVA2022

1– 9 March 2022
Geneva, Switzerland

SG13: Future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures

SG13 Vice-Chairman, Dr Rim Belhassine-Cherif
for the **SG13 Chairman, Dr Leo Lehmann**

March 2022

Study Group 13 Overview

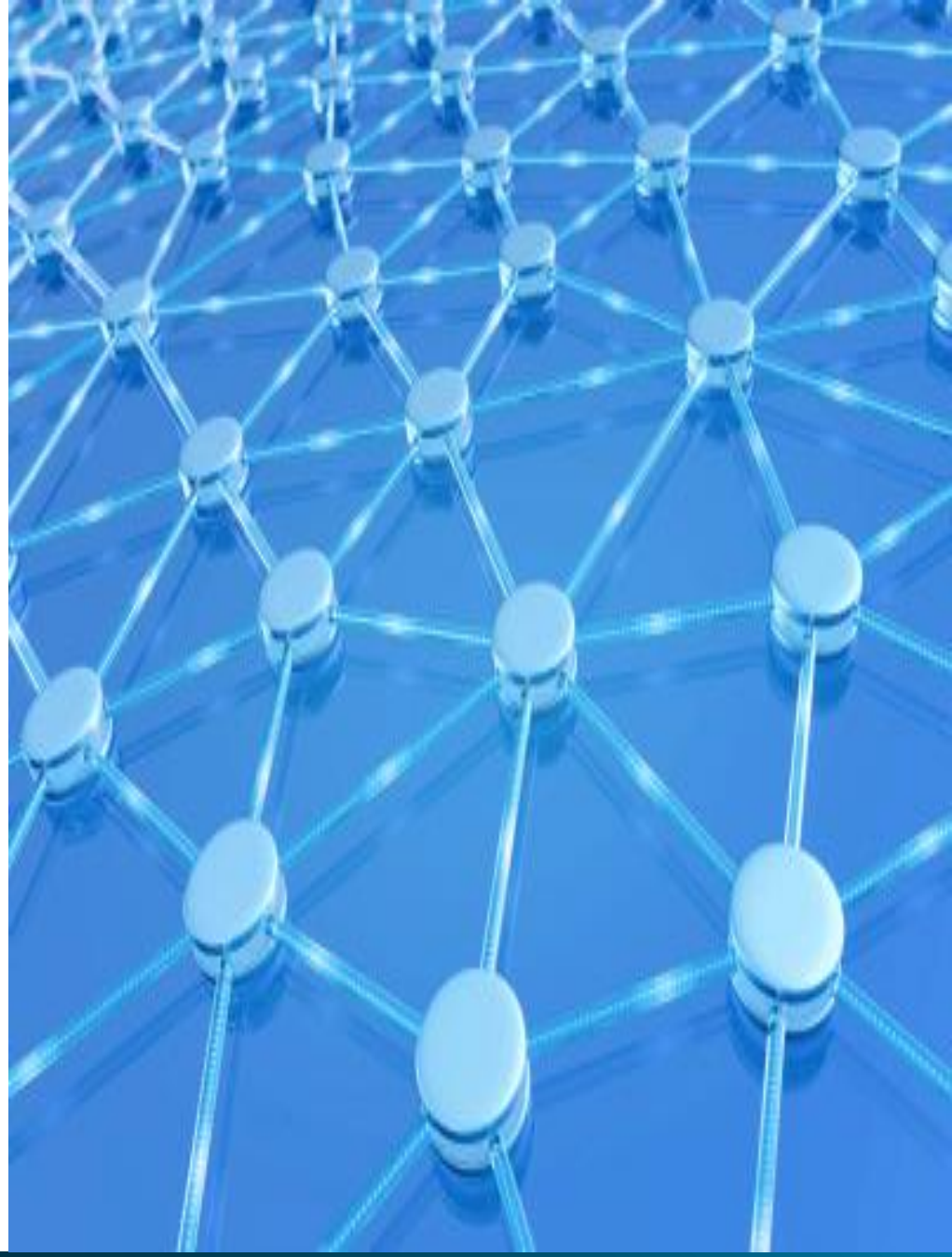
- ITU-T Study Group 13: "**Future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures**" *(WTSA-16 Resolution 2)*

- **SG13 is the lead Study Group on:**

Future networks such as IMT-2020 networks (non-radio related parts)	**Cloud Computing**
Mobility management	**Trusted network infrastructures**

Statistics: activities/structure

- **13** Questions assigned by WTSA-16
- **4** revised Questions during study period
- **13** Questions proposed for next study period
- **4** FGs (Focus Groups)
- **2** JCAs (Joint Coordination Activities)
- **2** RGs (Regional Groups)
- **3** Correspondence groups
- **1** JRG (join rapporteur group)
- **1** CQ (Quantum communications)
- **2** Long life ad-hocs
- **2** Questionnaires



Statistics: standards/delegates

11 STUDY GROUP MEETINGS

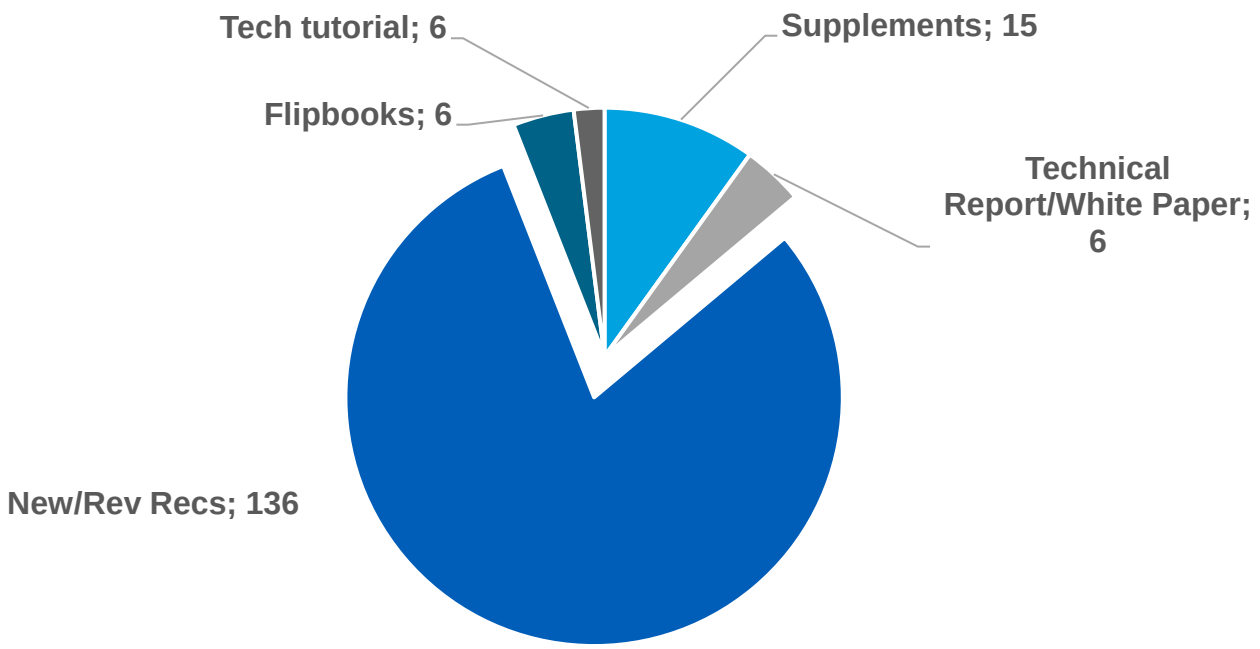
15 WORKING PARTY MEETING

219 RAPPORTEUR GROUP MEETINGS

1310 Contributions received (plus 1225 for the interim meetings)

218 Max/Min/ Average SG participants: 313/123/218

19+6 WORKSHOPS and technical tutorials



SG13 Achievements

- **IMT-2020: 49** Recs and **5** Supplements are approved and about **56** are under development
- **FMC: 8** Recommendations approved and **15** are under development
- **Trust in ICT: 10** Recommendations approved, **6** are in progress
- **Cloud computing and big data: 33** Recommendations and **4** Supplements are approved, **22** are in progress
- **Quantum Key Distribution Networks (QKDN):** initiated the work at ITU, approved first ITU Recommendation with QKDN overview. Approved **8** more Recommendations, **12** are ongoing. Published one Supplement
- **Machine Learning: 12** Recommendations and one Supplement are approved, **8** are in progress
- **Network 2030: 8** deliverables of the FG. **1** white paper, **2** Supplements and **1** Technical Report published

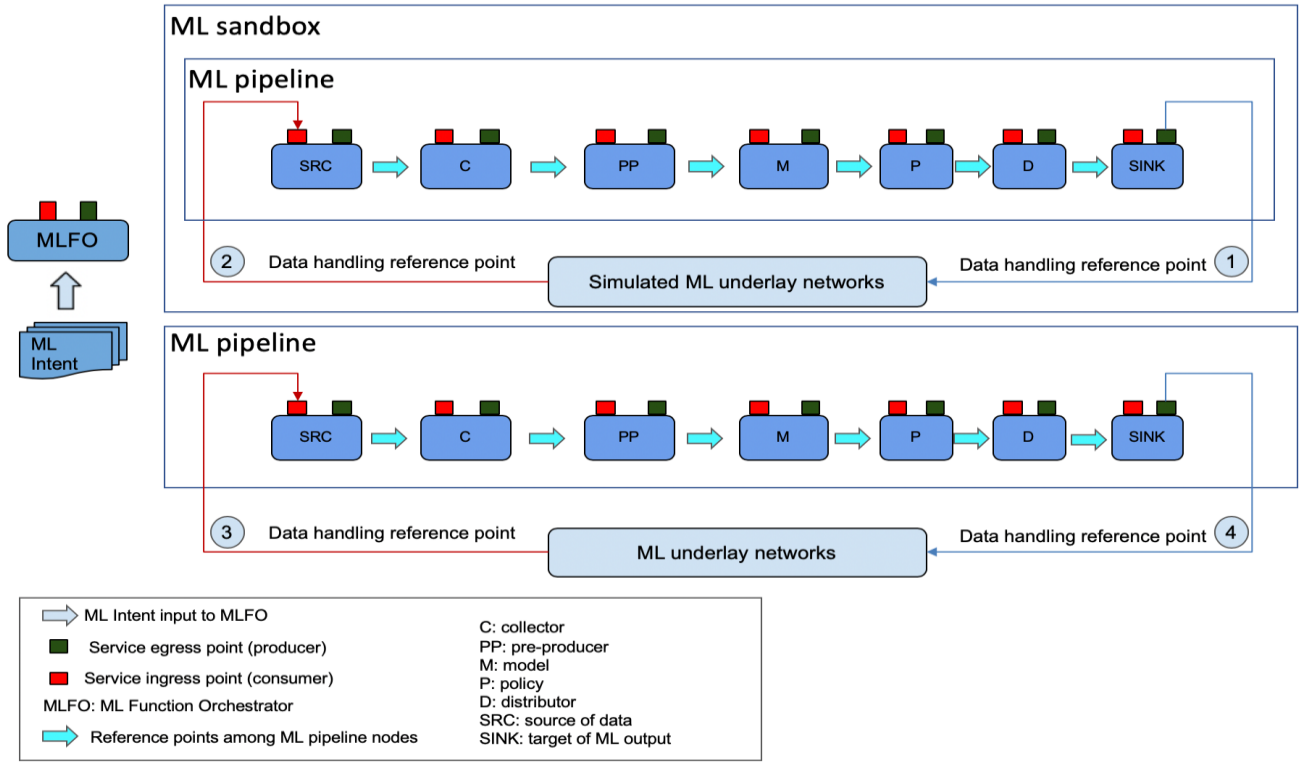
Y.3172 (06/19): Architectural framework for machine learning in future networks including IMT-2020

Remarkable Recommendations: Y.3172

Recommendation specifies an architectural framework for machine learning (ML) in future networks including IMT-2020, as well as a set of architectural requirements and specific architectural components needed to satisfy these requirements.

These components include ML pipeline plus ML management and orchestration functionalities.

The integration of such components into future networks including IMT-2020 and guidelines for applying this architectural framework in a variety of technology-specific underlying networks are also described.



High-level architectural components

Y.3800 (10/19): Overview on Networks Supporting Quantum Key Distribution

Remarkable Recommendations: Y.3800

Y.3800 specifies an overview on networks to support quantum key distribution (QKD) to address network aspects to implement QKD technologies. In particular, it addresses:

- an overview of QKD technologies
- network capabilities to support QKD
- conceptual structure and basic functions of QKD networks (QKDN)

QKDN design considerations:

- Security, scalability, stability, efficiency, application-oriented, robustness, integratability, interoperability, migratability, manageability

Basic functions of QKDN:

- Quantum key generation
- Key management
- QKDN control
- QKDN management

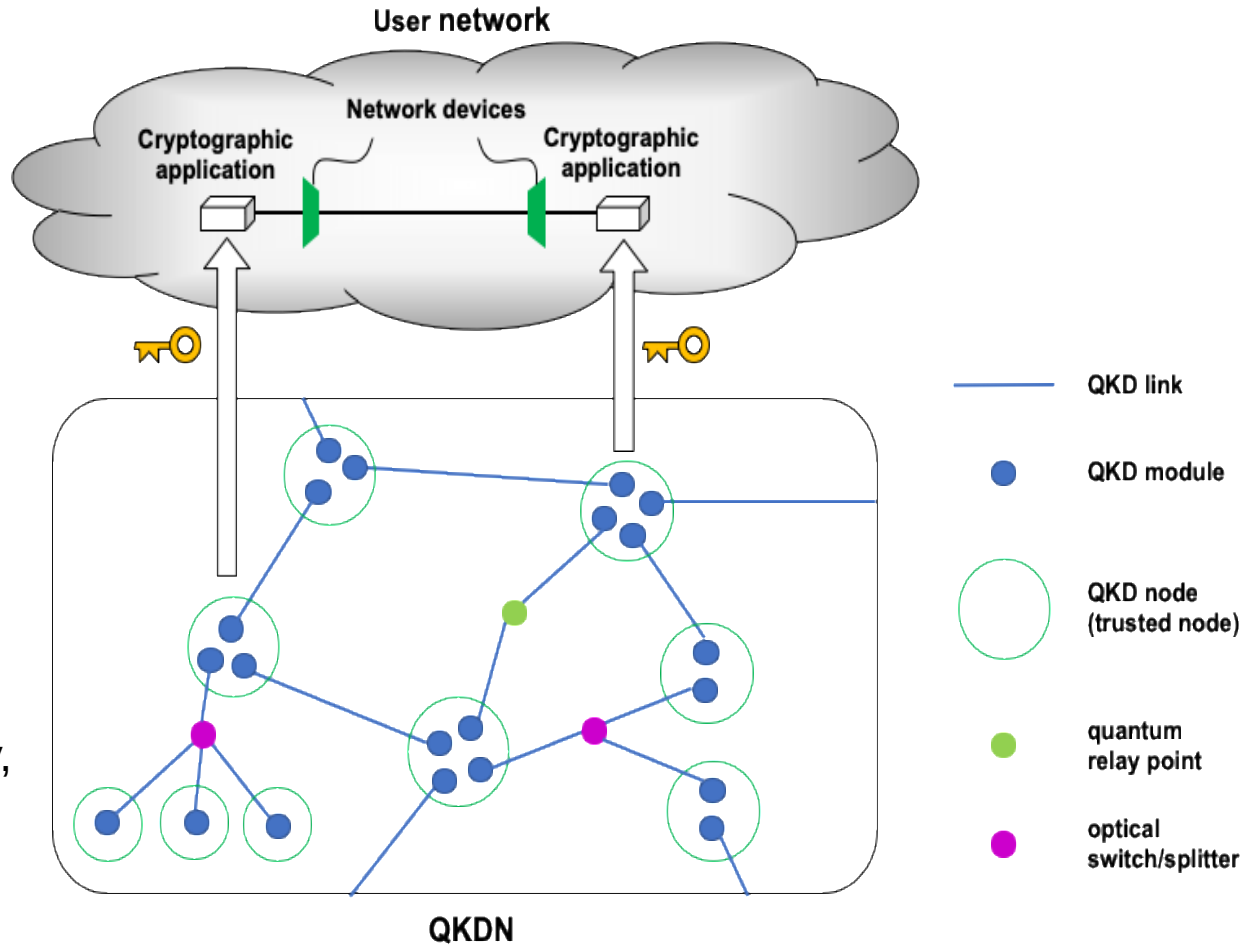


Illustration of QKDN concepts and their relation to a user network

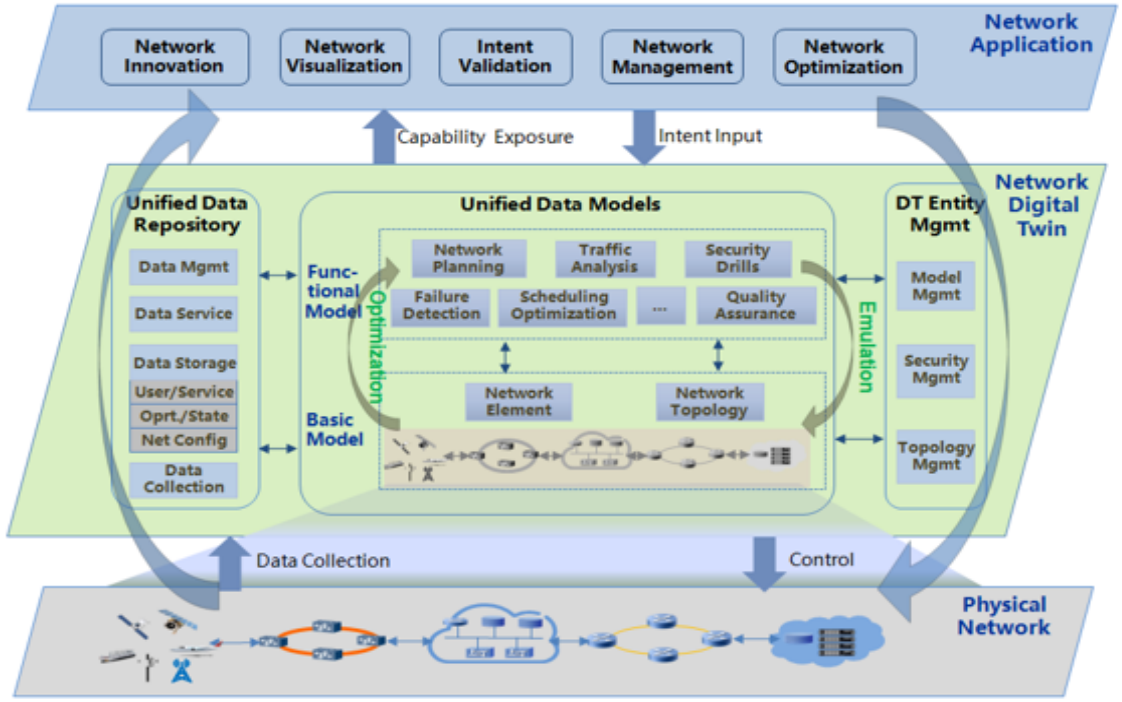
Y.3090 (02/22): Digital twin network - Requirements and architecture

Remarkable Recommendations: Y.3090

Digital Twin Network (DTN) is a virtual representation of a physical network. It is useful for analyzing, diagnosing, emulating and controlling the physical network based on data, model and interface, so as to achieve the real-time interactive mapping between physical network and virtual twin network. This Recommendation describes the requirements and architecture of digital twin network.

- Efficient data collection
- Efficient and unified data repository
- Unified data models for network applications
- Open and standard southbound and northbound interfaces
- Management
- Compatibility
- Scalability
- Reliability
- Security
- Privacy
- Flexibility
- Visualization
- Synchronization

Requirements of DTN



Reference Architecture of DTN

Y.3200 (02/22): Requirements of fixed, mobile and satellite convergence in IMT-2020 network and beyond

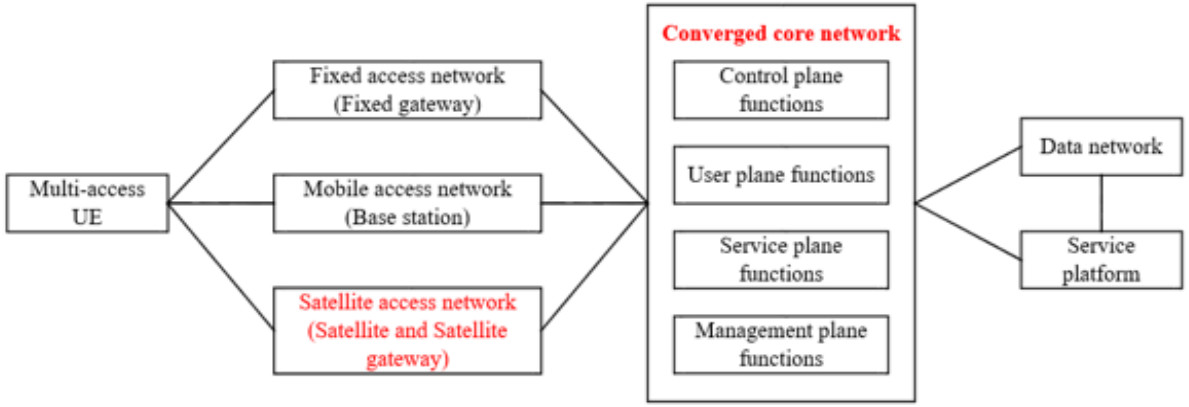
Remarkable Recommendations: Y.3200

Y.3200 specifies the following aspects of fixed, mobile and satellite convergence (FMSC) in the context of IMT-2020 network and beyond:

- Service requirements, which include general requirements of converged service and requirements of supported converged services.
- Network capability requirements, which include general requirements of converged network, requirements of converged network functions, and requirements of applying enabling technologies.
- Use cases of fixed, mobile and satellite convergence.

Service requirements

- Converged voice services, video services, message services, data services, broadcast services, and multicast services.
- Multi-access edge computing services, vertical industry services, international roaming services, and international communications services.



Network capability requirements

- Mobility management, session management, connection management, subscription management, authentication and authorization, policy control, capability exposure, user plane, service plane, and management plane.
- Satellite class, satellite link, and multi-connectivity.
- Applying AI/ML, DLT, and QIT.

SG13 opens the new horizons

New work started in this Study Period includes:

- **Machine Learning**
- **Quantum key distribution (networks)**
- **Digital twin network**
- **Fixed, mobile and satellite convergence**
- **Decentralized network infrastructure**
- **Intent-based network**
- **Container in cloud computing, micro-services**
- **Socio-technical standards**
- **Computing and network convergence**
- …

Please bring your ideas in 2022 and coming years!

In short, SG13 today

- **Innovative**: New ideas from research arms: digital twin, intend-based networks, Network 2030

- **Reliable**: Enhancements to the existing networks
- **Practicable**: Mobile communications (network aspects)
- **Intelligent**: Cloud computing, big data, future computing and processing enabling AI/ML
- **Modern**: Networks of the future (evolving edge computing)
- **Solution oriented**: New secure technics for networks (QKDN)

- **Supportive**: Assistance and solutions for developing countries

Future

SG13: All about networks

- **Future networks:**
  networks beyond IMT-2020, Network 2030
- **Evolving computing paradigm:** data handling and processing, computing and network convergence
- **AI to serve networks:** machine leaning and programmable networking solutions towards autonomous operation
- **Network softwarization and digital twin network**
- **Quantum enhanced networking**

SG13 Management Team

Chairman	Dr Leo Lehmann	(Switzerland)
Vice-Chairmen:	Mr Yoshinori Goto, Acting Chairman since June 2021	(Japan)
	Mr Ahmed Raghy (until June 2021)	(Egypt)
	Mr Cao Jiguang (succeed Mr Heyuan Xu)	(China)
	Dr Hyungsoo (Hans) Kim	(Republic of Korea)
	Mr Mohammed Al Tamimi	(Saudi Arabia)
	Mr Brice Murara	(Rwanda)
	Mr Scott Mansfield	(Ericsson, Canada)
	Dr Rim Belhassine-Cherif	(Tunisia)
	Dr Fidelis Onah	(Nigeria)
	Mr Juan Carlos Minuto	(Argentina)
TSB	Dr Tatiana Kurakova	
	Ms Shabnam (Shaba) Karimova (succeed Ms Na Demoulin)	

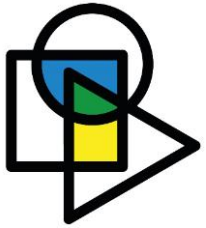
SG13 “Future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures”,

its Chairman Dr Leo Lehmann,

Acting Chairman Mr Yoshinori Goto and

Vice-chairman Dr Rim Belhassine-Cherif

are thankful to you for your attention



Additional Slides

Future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures

"A collection of networks, end user equipment, information, and human resources which can be used to access valuable information, communicate with each other, work, learn, receive entertainment from it, at any time and from any place, with affordable cost on a global scale."

G.101 "Global Information Infrastructure terminology: Terms and definitions" (03/2000)

SG13 Regional Group for Africa

The main objective: encourage national authorities and operators from countries in Africa to work together and better contribute to ITU-T SG 13 activities in general and to Cloud Computing in particular in line with SG 13 mandate.

Terms of Reference:

a) To encourage participation in the SG 13 and to report SG 13's outcomes and deliverables.
b) To maintain an electronic forum on evolving computing paradigm incl. regulatory issues.
c) To establish training needs on current standardization areas in Africa and coordinate the organization of technical tutorials in the region on such topics with SG 13.
d) To encourage African countries to the development of new/revised ITU-T Recommendations on current standardization areas.
e) To disseminate relevant information provided by ITU-T on current hot topics and future networks standards and document relevant use cases of future computing architectures and services including emerging mobile services.
f, g) To provide the focal points identified on hot topics issues and future networks in African countries and to collaborate with African Telecommunication Union (ATU).
h) Act as a liaison body between administrations, operators, regulators and ITU-T in matters relating to hot standardization areas.
•i) Continent priorities are set to: *Future Computing and Data Prosessing, Artificial Intelligence as applied to networks, IMT-2020 (non radio aspects), Next generation of IMT networks and machine learning, Future networks (Network 2030), Trust*

SG13 Regional Group for for EECAT

The main objective of the Regional Group is to encourage national authorities and operators, manufactures and scientific-research institutions from CIS/RCC countries of Eastern Europe, Central Asia and Transcaucasia region to work together towards coordinated standardization proposals and increase quality and quantity of contributions to ITU-T SG13 in general and to Big Data/Cloud Computing and future networks (2030+) in particular in line with SG13 mandate.

Terms of Reference:

- ❑ To encourage active participation of RCC/CIS countries from Eastern Europe, Central Asia and Transcaucasia region administrations, regulators and operators in the work of ITU-T SG13 and to report to them ITU-T SG13 outcomes and deliverables.
- ❑ To establish training needs on big data/cloud computing and future networks for operators and regulatory authorities in region and coordinate the organization of technical tutorials in the region on such topics with ITU-T SG13.
- ❑ To convene workshops for this region in order to raise the understanding of standards and increase the standard-developing skill and abilities
- ❑ Act as facilitator for contributing to the parent SG.
- ❑ To reflect the relevant priorities of the region as per ITU-T SG13 mandate. Focus on the following Priority areas are:

  Big Data/Cloud Computing
  Edge Mobile
  Networks around 2030 and beyond

- ❑ To disseminate relevant information provided by ITU-T on big data/cloud computing and future networks standards and document relevant use cases of distributed calculation, storage, analytics and services including emerging services offered by new infrastructures.
- ❑To collaborate with CIS/RCC and national standards developing bodies.
- ❑To serve an incubator of new ideas for future technologies and their implementation scenarios shaped to the best to work in this part of the world.

JCA-SDN

JCA-SDN “Joint Coordination Activity on Software-Defined Networking”:

- Created by TSAG in June 2013
- Since June 2015 JCA-SDN reported its progress to SG13
- Extended in February 2017 to run until the end of 2017
- Maintained the SDN standardization roadmap
- Accomplished its activities in November 2017
- Passed over the SDN standardization roadmap to the JCA-IMT2020

JCA-IMT2020

JCA-IMT2020 “Joint Coordination Activity on IMT-2020”:

- Created by SG13 in February 2017
- Maintains the SDN standardization roadmap
- Started and maintains the IMT-2020 standardization roadmap
- Published a snapshot of IMT-2020 roadmap as Supplement 59 to Y.3100-series in March 2020
- Lifetime extended until the end of 2022
- Name of the group changed to *Joint Coordination Activity on IMT-2020 and Beyond* (JCA-IMT2020)

Focus Group on ML5G

- Established in November 2017, run until July 2020
- Looked after machine learning (ML) for future networks, including interfaces, network architectures, protocols, algorithms and data formats
- Reported to SG13
- Had 9 meetings and 7 workshops
- Delivered 11 technical specifications and technical reports including the Gap Analysis Report identifying the area for future work

Focus Group on Network 2030

- Established in July 2018, run until July 2020
- Looked after the capabilities of networks for the year 2030 and beyond
- Reported to SG13
- Had 7 meetings and 6 workshops
- Delivered the Gap Analysis Report identifying the areas for future standardization efforts application and 8 technical specifications and technical reports
- Complemented the work in ITU-R on beyond IMT-2020
- Set up a vision for Network 2030 and its architecture framework

Focus Group on Autonomous Networks (FG-AN)

- Established in December 2020, running until present
- Working on autonomous networks, including exploratory evolution in future networks, real-time responsive experimentation, dynamic adaptation to future environments, technologies, and use cases
- Reports to SG13
- Had 6 meetings and 30+ weekly calls
- First deliverable was submitted to its parent group in November 2021 (Use cases for autonomous networks).
- Currently, the group is progressing technical specifications, technical reports and proof of concepts


ITU